

AP: CHAPTER 4

CARBON AND THE MOLECULAR DIVERSITY OF LIFE

+1 1. Define organic chemistry.

The branch of chemistry that specializes in the study of carbon compounds

+1 2. How did Stanley Miller's classic experiment apply mechanism to the evolution of life?

By creating organic compounds from inorganic compounds Miller showed that physical & chemical laws govern all natural phenomena

+2 3. What determines the overall shape of an organic molecule? Of what biological importance is the shape of organic molecules?

How many of each atom & the # of bonds

The shape determines its properties & the function

+2 4. What is a hydrocarbon? Are hydrocarbons important in living organisms?

Hydrocarbons are organic molecules consisting of only carbon & hydrogen Yes

5. Define the following:

+1/2 a. Isomers Compounds that have the same # of atoms of the same elements but different structures

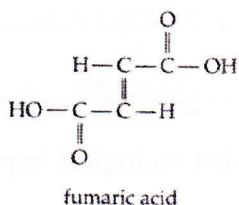
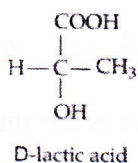
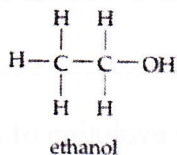
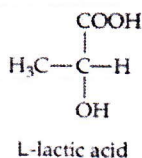
+1/2 b. Geometric Isomers have the same molecular formula & covalent arrangements but differ in the spatial arrangement of their atoms

+1/2 c. Enantiomers Isomers that are mirror images of each other

+1 6. Why are enantiomers of biological interest?

Two enantiomers may not have the same effect, some may be neutral having no effect & some may be harmful

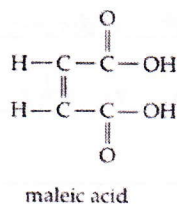
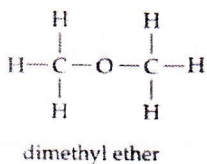
7. Identify the structural isomers, geometric isomers, and enantiomers from the following compounds.



+1 Structural isomers Ethanol / dimethyl ether

+1 Geometric isomers fumaric acid / maleic acid

+1 Enantiomers L-lactic acid / D-lactic acid



+1 8. What does the term *amino acid* signify about the structure of such a molecule?

It has both an amino group ($-\text{NH}_2$) and a carboxyl group ($-\text{COOH}$)

+1 9. What chemical change occurs when ATP reacts with water and releases energy?

ATP molecule loses a phosphate & becomes ADP

10. Match each of the following functional groups with its correct description.

+1/2 A Sulfhydryl group

A. Stabilizes the structure of proteins

+1/2 C Hydroxyl group

B. Found within the structure of ATP & DNA; Provides the backbone for phospholipids

+1/2 D Carbonyl group

C. The functional group of alcohols

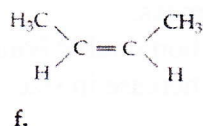
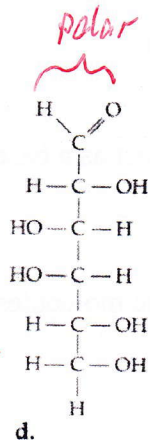
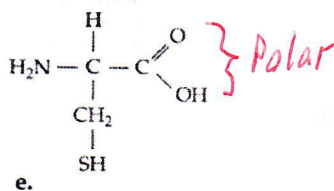
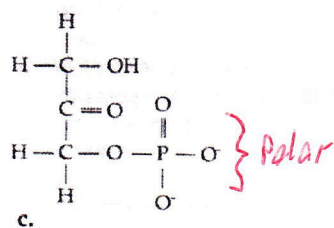
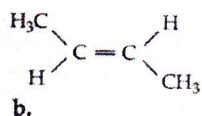
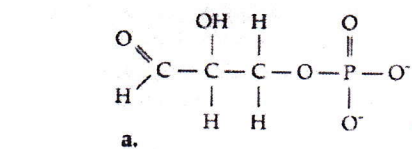
+1/2 B Phosphate group

D. Used in the building of fats and carbohydrates; Gives rise to aldoses & ketoses

+1/2 F Carboxyl group

E. A key component of the amino acids & fatty acids; Has acidic properties

11. Match the structures **a-f** to the terms at the right. Choices may be used more than once; more than one right choice may be possible.



+1/2 A, C a. Structural isomers

+1/2 B, F b. Geometric isomers

+1/2 E c. Carboxylic acid

+1/2 E d. Can make cross-link in protein

+1/2 A, C, D, E e. Hydrophilic

+1/2 B, F f. Hydrocarbon

+1/2 E g. Amino acid

+1/2 A, C h. Organic phosphate

+1/2 A, D i. Aldehyde

+1/2 E j. Amine

+1/2 C k. Ketone

Select the best answer.

+1/2 C 12. The tetravalence of carbon most directly results from

- its tetrahedral shape.
- its very slight electronegativity.
- its four electrons in the valence shell that can form four covalent bonds.
- its ability to form single, double, and triple bonds.
- its ability to form chains and rings of carbon atoms.

+1/2 B 13. Hydrocarbons are not soluble in water because

- they are hydrophilic.
- the C-H bond is nonpolar.
- they do not ionize.
- they store energy in the many C-H bonds along the carbon backbone.
- they are lighter than water.

+1/2 E 14. Which of the following is *not* true of an asymmetric carbon atom?

- a. It is attached to four different atoms or groups.
- b. It results in right- and left-handed versions of molecule.
- c. It is found in all enantiomers.
- d. Its configuration is in the shape of a tetrahedron.
- e. It is found in all geometric isomers.

+1/2 A 15. Which of the following is mismatched with its description?

- a. phosphate-forms bonds that stabilize protein structure
- b. hydroxyl and carbonyl-components of sugars
- c. ATP-source of energy for cellular processes
- d. methyl-addition changes shape and function of molecules
- e. amino and carboxyl-components' of amino acids

+1/2 D 16. The chemical group that can cause an organic molecule to act as a base is

- a. $-\text{COOH}$.
- b. $-\text{OH}$.
- c. $-\text{SH}$.
- d. $-\text{NH}_2$.
- e. $-\text{CH}_3$.

+1/2 A 17. The chemical group that confers acidic properties to organic molecules is

- a. $-\text{COOH}$.
- b. $-\text{OH}$.
- c. $-\text{SH}$.
- d. $-\text{NH}_2$.
- e. $-\text{CH}_3$.

+1/2 D 18. Which statement is *not* true about structural isomers?

- a. They have different chemical properties.
- b. They have the same molecular formula.
- c. Their atoms and bonds are arranged in different sequences.
- d. They are a result of restricted movement around a carbon double bond.
- e. Their possible numbers increase as carbon skeletons increase in size.

+1/2 D 19. The fats stored in your body consist mostly of

- a. methyl groups.
- b. alcohols.
- c. carboxylic acids.
- d. hydrocarbons.
- e. organic phosphates.

+1/2 C 20. How many asymmetric carbons are there in the sugar ribose shown below?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

